Economics Information

Ontario

POTATO PACKING AND STORAGE COSTS
1981-82 Crop Year

BY

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SUMMARY

Storage and packing costs comprise a significant portion of the production and marketing costs of potatoes. At the farm level they can make up as much as 40 percent of the total cost.

The cost of storing potatoes for one month was estimated at $0.86 per hundredweight. The cost of storing for nine months was estimated to be $1.76 per hundredweight. When the shrinkage factor was considered the storage costs were estimated at $0.90 per hundredweight for one month and $1.98 for nine months.

The cost of growing and harvesting potatoes has been estimated at $5.49 per hundredweight harvested. When the shrinkage factor is taken into account, growing and harvesting costs were estimated to be $5.75 per hundredweight marketed.

Total growing, harvesting, and storage costs per marketed hundredweight were estimated to be $6.65 per hundredweight after one month of storage, $8.15 per hundredweight after nine months.

Labor costs were found to be the single most important cost item in the cost of packing potatoes. The cost of packing potatoes in 75-pound bags was estimated at $2.16 per hundredweight. Estimates of the cost of packing potatoes in 10-pound bags ranged from $2.31 per hundredweight to $2.65 per hundredweight depending on the volume packed.

INTRODUCTION

Production costs up to and including harvesting are well documented. Storage and packing costs can comprise up to 40 percent of the total cost of growing and marketing potatoes at the farm level. The purpose of this study is to examine factors that influence costs at both the producer and primary packing level and to provide representative cost data.

In this study, all operations that take place after harvesting and prior to transportation to a wholesaler or retailer are considered. Such operations generally include loading into storage, washing or brushing, damp drying, sizing, grading, packaging—bag tying or bag stitching—and loading for transport.

Costs have been tabulated on a per-volume basis and information has been collected from both the grower/packer and from private firms whose business function is the packing of potatoes and other vegetables, and who are not necessarily in the business of growing potatoes. It should be noted that any figures presented in the following pages are representative of potatoes grown for tablestock or the fresh market trade.

METHODOLOGY

All costs in this report are based on information collected from 14 growers who stored and/or packed part of their 1981-82 crops for either the fresh market or processing trade. Information was also collected from three commercial farms whose primary business activity is the packing of potatoes for the fresh market.

Information from both sources was used to develop three models:

1. The cost of storing potatoes;
2. The cost of packing potatoes in 75-pound bags; and
3. The cost of packing potatoes in 10-pound bags.

Production costs were simulated from data supplied by the above cooperators and from well documented research reports and literature.

The storage model represents costs that might be incurred on a farm of about 200 acres and under conditions where storage facilities are fully utilized. The packing model for 75-pound bags represents a medium-sized grower/shipper with a standard grading line. The 10-pound packing model represents a firm packing from 613 thousand to 1.84 million pounds per year. In the case of the 10-pound model, fixed and variable costs are estimated for 80- 120- and 240-day runs.

For all types of equipment, depreciation was estimated on a straight line basis assuming a 20-year life. Machinery and labor costs were calculated on a per hour and per unit basis and based on cooperators' estimates of equipment and labor requirements. Capacities in terms of pounds of potatoes packed per hour are based on a 36 inch wide grading line capable of receiving up to 14,000 pounds per hour and based on an 8-hour day with 10 percent downtime to account for startup, breaks, etc.

Interest on operating capital is charged at the rate of 1.55 percent per month. Operating capital includes the cost of bags. For most farming operations, interest on operating capital is charged on all cash costs. However, in the case of a packer, potatoes are being sold daily or weekly; which means the packer will be recovering all of his cash cost items such as labor and electricity almost immediately. Therefore, interest on operating capital is charged on the bags only.

MODEL I: STORAGE COST

Storage costs were divided into the following categories: buildings, machinery, labor, materials, insurance, electricity, fuel and water, and interest on inventory.

BUILDINGS

According to the survey, a typical concrete block storage facility in Ontario might be 120 feet long, 60 feet wide and have an area of 7,200 square feet. It would have a poured concrete floor and with ventilation

Table 1.—Annual Costs for a Typical Potato Storage Facility with No Refrigeration, 1981-82 Crop Year

Item	Storage cost	
	Annual	Per cwt.[a]
	dollars	cents
Depreciation	5,303.80	13.89
Interest	7,624.21	19.95
Insurance	530.38	1.39
Repairs	1,591.14	4.17
Total	15,049.53	39.40

[a]Based on an estimated storage capacity of 38,196 hundredweight.

ducts to improve air circulation. Sidewalls would have wood slats to further improve air circulation. It is assumed that there would be an additional 40 by 50 foot area that would be used for machinery storage, grading, or other purposes. The total area of the storage facility would be 9,200 square feet and would be capable of storing approximately 38,196 hundredweight of potatoes.

Average construction costs were found to be $11.53 per square foot for all producers on the study. Total construction costs for the model were estimated in the following way.

	Dollars
Storage bins, 120 x 60 x $11.53	83,016
Grading area, 40 x 50 x $11.53	23,060
Total	106,076

Using the estimated construction costs as a base, annual building costs were calculated (Table 1).

	Percent
Depreciation	5.0
Int. on invest. (½ bldg. value $53,038)	14.375
Insurance	0.5
Repairs	1.5

Total building costs for the 1981-82 crop year were estimated at $15,049.53 or 39.40¢ per hundredweight of storage capacity. The capacity for potato storage can be calculated in the following manner.

$$\text{Potato storage capacity (cwt.)} = \frac{L \times W \times D \times 42}{100}$$

where L = the inside length of all bins in feet
W = the inside width of all bins in feet
D = the normal height of the potato pile in feet
42 = pounds of potatoes in one cubic foot.

The survey results indicate storage capacity would be:

$$\frac{116 \times 56 \times 14 \times 42}{100} = 38{,}196 \text{ cwt.}$$

Table 2.—Equipment Costs Associated with Potato Storage, 1981-82 Crop Year

Item	New cost	Age	Hours of annual use	Per hour		Per cwt.[a]
				Fixed	Variable	
	dollars		no.	dollars		cents
Skid loader	12,500	5	130	16.09	1.12	5.74
Hopper	2,085	6	130	2.61	.42	1.01
Bin piler	14,000	6	310	7.35	1.26	2.87
Forklift	9,500	18	130	11.13	.86	4.00
Total				37.18	3.66	13.62

[a]Based on an average of 300 hundredweight of storage loaded out per hour.

MACHINERY AND LABOR

Most of the machinery and labor costs are incurred when the potatoes are loaded out of storage for packing or for transportation to a packing plant. Labor and machinery costs both are calculated on an hourly basis and are tied to rates of accomplishment. A description of equipment costs is provided in Table 2.

All equipment listed in Table 2 represents average purchase prices, average age, and the hours of use for each piece of equipment provided that approximately 38,196 hundredweight of potatoes were stored and that potatoes were taken out at the rate of 300 hundredweight per hour. Total hourly costs for the above machinery were estimated to be $40.84. The cost per hundredweight was estimated at 13.62¢ per hundredweight.

Most of the labor required for storage is involved in either operating machinery or grading on the bin piler. Labor costs are summarized below.

	Dollars per hour
Loading out of storage	
4 persons @ $6.00/hr.	24.00
Employer-paid benefits:	
Unemployment insurance	.60
Canada Pension Plan	.43
Workmen's compensation	.91
Total	1.94
Total:	
Per hour	25.94
Per cwt. @ 300 cwt. per hour	0.0865
Storage maintenance	
7 hrs. per wk. for 26 wks. = 182 hrs. @ $6.00 = $1,092 ÷ 38,196 cwt.	0.0286
Spraying and cleaning	
21 hrs. @ $6.00 = $126.00 ÷ 38,196 cwt.	0.0033

MATERIALS

Material costs include disinfectant and, in some cases, a sprout inhibitor. Disinfectant for 35,000 to 40,000 hundredweight of storage space would cost about $50.00. In 1982 the custom rate for the application of a sprout inhibitor was quoted at 9¢ per hundredweight.

OTHER COSTS

The remaining costs of storage are listed below.

Item	*Cost for one month, ¢/cwt.*
Insurance, .375¢ per cwt. per month	0.38
Electricity, 130 kwh per day at 3.75¢ per kwh, 130 kwh x 30 days x 3.75¢ ÷ 38,196 cwt.	0.38
Interest on inventory, 1.75% of value per month, 0.0175% x $6.00 (value per cwt.)	10.50
Fuel and water	1.00
Total	12.26

TOTAL BASIC COSTS

The summary of costs presented in Table 3 are for one month only. The longer a crop is held in storage the greater will be some costs both in total and on a per-hundredweight basis. Examples of these costs are insurance, electricity, and interest on inventory.

SHRINKAGE

The weight loss that potatoes can undergo in storage can be considerable. Weight loss is dependent on their condition at harvesting time. Humidity and temperature facilities and the length of storage. According to Smith, potatoes harvested in the normal manner can lose as much as 4.5 percent in weight after one month of storage; 6.5 percent after three months; and 10.0 percent after seven months. If growers are to obtain a realistic picture of their production and storage costs, costs should be based on the quantity marketed. The first line of Table 4 lists shrinkage factors that apply as potatoes are held in storage from one to nine months.[1]

TOTAL COSTS

The total costs involved in the production of potatoes include the cost of growing, harvesting, and storing potatoes. In a recent study, Campbell[2] estimated the cost of growing and harvesting potatoes in

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[1] Ora Smith. *Potatoes: Production, Storing, Processing.* (Westport Connecticut: The Avi Publishing Company Inc., 1977).

[2] Blair Campbell. *Estimated Cost of Growing Potatoes, 1981.* (Toronto: Economics Branch, Ontario Ministry of Agriculture and Food, 1982.)

Table 3.—Potato Storage Costs for One Month, 1981-82 Crop Year

Item	Cost per cwt.[a]	Percent of total
Building costs:	cents	percent
Depreciation	13.89	16.1
Interest	19.95	23.2
Insurance	1.39	1.6
Repairs	4.17	4.8
Total	39.40	45.7
Machinery:		
Depreciation	5.53	6.4
Interest	5.72	6.7
Storage	1.15	1.3
Repairs	1.22	1.4
Total	13.62	15.8
Labor:		
Loading out of storage	8.65	10.0
Storage maintenance	2.86	3.3
Spraying, cleaning storage	.33	.4
Total	11.84	13.7
Materials:		
Sprout inhibitor, custom application	9.00	10.4
Disinfectant	.13	.2
Total	9.13	10.6
Other:		
Insurance	.38	.4
Electricity	.38	.4
Fuel and water	1.00	1.2
Interest on inventory	10.50	12.2
Total	12.26	14.2
TOTAL BASIC COST For one month	86.25	100.0

[a]Based on a storage unit with a capacity of 38,196 hundredweights, and assuming full capacity, costs are calculated for one month of storage. Shrinkage costs are not included.

Ontario to be $5.49 per hundredweight. Estimated storage costs (before shrinkage) range from $0.86 to $1.76 per hundredweight, depending on the amount of time stored (Table 4).

In this model, the shrinkage factors shown in Table 4 were utilized to calculate costs per hundredweight after shrinkage. Shrinkage ranged from 4.5 percent after one month of storage and with a gradual upward trend to 11 percent after 9 months. The procedure used to account for the shrinkage factor, was to divide total costs by one minus the shrinkage factor. This in effect reduces the cost per harvested yield to cost per marketed yield. Total production costs are presented in Table 4.

Table 4.—Potato Production Costs by Months of Storage, 1981-82 Crop Year

	Months of storage								
	1	2	3	4	5	6	7	8	9
Shrinkage, %	4.50	5.50	6.50	7.50	8.50	9.50	10.00	10.50	11.00
COSTS PER CWT.									
Before shrinkage:									
Production[a] ...	5.49	5.49	5.49	5.49	5.49	5.49	5.49	5.49	5.49
Storage	0.86	0.98	1.09	1.20	1.31	1.43	1.54	1.65	1.76
Total	6.35	6.47	6.58	6.69	6.80	6.92	7.03	7.14	7.25
After shrinkage:									
Production	5.75	5.81	5.87	5.94	6.00	6.07	6.10	6.13	6.17
Storage	0.90	1.03	1.16	1.30	1.43	1.57	1.71	1.84	1.98
Total	6.65	6.84	7.03	7.24	7.43	7.64	7.81	7.97	8.15

[a]Blair Campbell. *Estimated Cost of Growing Potatoes, 1981.* (Toronto: Economics Branch, Ontario Ministry of Agriculture and Food, 1982.).

After the shrinkage factor is taken into account, costs to growers will range from $6.65 per hundredweight marketed, to $8.15 per hundredweight marketed.

MODEL II: PACKING COSTS FOR 75-POUND BAGS

DATA SOURCE AND DESCRIPTION

Usually a large portion of the crop destined for tablestock is packed in bags ranging in sizes of 5 to 75 pounds. Many of the growers use 75-pound bags. Accordingly, the figures presented below are representative of the costs of a relatively large grower/shipper who packs 75-pound bags. All of the data presented below are based on questionnaires distributed to 14 growers during January 1982, and other supplementary information.

The following assumptions have been made.

1. All of the potatoes will be graded out over a 60-day period;

2. A total of about 32,000 hundredweight would be packed out;

3. The grower has a grading line width of 36 inches and that under normal conditions, maximum output would be in the range of 800 bags per day. Allowing for downtime, breakdown, set-up, etc., the average output per day would be 717 bags;

4. The grading crew would consist of 9 persons—1 skid loader

Table 5.—Annual Costs for a Typical Grading Area Used to Pack 75-Pound Bags of Potatoes, 1981-82 Crop Year

Item	Total cost	Cost per 75-lb. bag[a]
	dollars	cents
Depreciation	3,175.36	7.38
Interest	4,564.58	10.61
Insurance	317.54	.74
Repairs	952.61	2.21
Total	9,010.09	20.94

[a]Based on an average of 43,020 75-pound bags packed per year.

operator, 2 graders, 2 weight checkers, 1 bag stitcher, 1 baler, 1 pallet mover, and 1 supervisor; and

5. The equipment used in this particular operation would be 6' by 8' hopper, a 36" jumbo sizer, a sorting table, 2 baggers, and an industrial sewing machine for 75-pound bags, a skid loader, and a forklift.

The potatoes are taken out of bulk storage bins by means of a skid loader, and placed in a 6' by 8' hopper. The potatoes pass over a jumbo sizer that removes oversize potatoes. They then move to a sorting table where culls and foreign material are removed by hand. The sorting table consists of a screen conveyor that allows undersize potatoes to fall through and move out the side into pallet boxes. At the end of the grading line the potatoes fall into 75-pound bags where they are weighed and closed by means of a sewing machine. The bags are piled on skids and are moved by a forklift to trucks for transportation.

THE COMPONENTS OF PACKING COSTS

The cost of grading and packing potatoes was broken down into the following categories: buildings, equipment (including the cost of installation), electricity, labor, bags, interest on operating capital, marketing board fees, and office supplies.

BUILDING COSTS

Part of the potato storage buildings will be used as a grading area. An appropriate grading area would be about 54' by 102' or 5,508 square feet. Construction costs for the potato storage are $11.53 per square foot. Total construction costs for the grading area were: 54 x 102 x $11.53 = $63,507.24.

Total costs associated with the buildings consisted of four items: depreciation, interest on investment, insurance, and repairs. Depreciation was estimated at 5 percent of the construction costs. Interest on investment was calculated at 14.375 percent of one-half of the construction costs. Insurance was estimated at .5 percent and repairs at 1.5

Table 6.—Equipment Costs Associated with Packing Potatoes, 75-Pound Bags, 1981-82 Crop Year

Equipment	New cost	Hours of annual use	Per hour		Per 75-lb. bag
			Fixed	Variable	
	dollars	no.	dollars		cents
Hopper	3,500	380	1.03	0.70	1.93
Sizer	5,500	480	1.63	1.10	3.05
Sorting table	6,500	480	1.92	1.30	3.59
Baggers (2)	700	480	0.21	0.14	0.39
Sewing machine	750	480	0.22	0.15	0.41
Skid loader	15,000	610	4.43	1.35	6.45
Forklift	22,000	610	6.50	1.98	9.47
Skids (200)	3,000	480	0.88	1.40	2.54
Total	56,950		16.82	8.12	27.83

percent of the construction. Building costs associated with the costs of packing potatoes are presented in Table 5.

Total building costs associated with packing potatoes were estimated at $9,010.09, or 20.94¢ per 75-pound bag.

EQUIPMENT COSTS

Table 6 presents the equipment costs that a typical potato grower might incur in packing potatoes. Depreciation is calculated on a straight line basis and a useful life of 20 years is assumed for the machines. Interest on investment is calculated at 14.375 percent of the average investment (one-half of new costs). Insurance and housing are calculated at the rate of 1.5 percent of the purchase price and hourly repair at rates of 9 to 30¢ per $1,000 of the original purchase price, depending on the machine.

Fixed and variable equipment costs together were estimated at $24.94 per hour (Table 6). On a per-bag basis this amounted to 27.83¢.

LABOR

The hourly wage rate paid would depend on the skill of the worker and on the type of work done. Wage rates varied from $4.85 per hour for two graders to $8.00 per hour for a supervisor. Total labor costs were estimated at $50.60 per hour. Employee paid benefits add an additional $4.11 per hour to the costs. This model used the assumption that 717 bags could be packed in an 8-hour day; therefore, the cost per 75-pound bag could be calculated in the following manner: $54.71 x 8 ÷ 717 = 61.04¢ per bag (Table 7).

Table 7.—Labor Costs for Packing Potatoes in 75-Pound Bags, 1981-82 Crop Year

Item	Per hour
	dollars
Employees:	
1 skid steer operator	6.50
2 graders @ $4.85 per hour	9.70
2 weight checkers @ $4.85 per hour	9.70
1 stitcher	4.85
1 baler	5.35
1 pallet mover, loads trucks as well	6.50
1 supervisor	8.00
Total	50.60
Employer paid benefits:	
Unemployment insurance	1.28
Canada Pension Plan	.91
Workmen's compensation	1.92
Total	4.11
TOTAL	54.71
	cents
Total costs per 75-lb. bag[a]	61.04

[a]Based on 717 bags packed per 8-hour day.

Table 8.—Cost of Packing Potatoes in 75-Pound Bags,[a] 1981-82 Crop Year

Costs	Cost per 75-lb. bag	Percent of total
	cents	percent
Fixed:		
Grading area	20.94	13.0
Equipment	18.77	11.7
Installation	0.58	0.3
Total	40.29	25.0
Variable:		
Equipment (operating)	9.06	5.6
Electricity	2.51	1.6
Labor	61.04	38.0
Bags	41.00	25.5
Interest on operating capital	1.23	0.8
Marketing Board fees	.75	0.5
Office supplies	4.82	3.0
Total	120.41	75.0
TOTAL	160.70	100.0

[a]Based on 717 bags packed per day for a 60-day run.

TOTAL COSTS

FIXED

Total costs have been broken into fixed and variable costs (Table 8). Fixed costs constitute 25 percent of the total and variable costs the remainder, or 75 percent.

Fixed installation costs were estimated at $5,000. This would include installing all equipment plus wiring. This installation is expected to have a life of 20 years, or annual costs of $250. Cost per 75-pound bag would therefore be .58¢.

VARIABLE

Interest on operating capital was calculated at the rate of 1.5 percent of the cost of bags for 2 months, the assumed operating period.

Electricity was estimated at the rate of 2 percent of the new cost of equipment, or 2.51¢ per 75-pound bag packed.

Marketing Board fees are levied at the rate of 0.75¢ per bag (1 cent per hundredweight), and office supplies at 3 percent per bag.

The variable costs of packing potatoes in 75-pound bags were found to be $1.20 per bag. Total costs were $1.60 per bag or $2.14 per hundredweight.

Major cost items were labor, 38 percent; bags, 26 percent; and grading area, 13 percent.

MODEL III: PACKING COSTS FOR 10-POUND BAGS

This budget is representative of a firm whose main business activity is the packing of potatoes for the wholesale and retail fresh market trade. In this production cost model, it was assumed that all of the potatoes are packed in 10-pound bags. Since costs vary considerably according to volume packed, the costs for 80- 120- and 240-day runs have been worked out.

NATURE OF COSTS

In a packing plant many factors affect cost of production; some of which are the total volume packed, plant layouts, the skill of the workers, and the degree of mechanization. Today, packing plants are highly mechanized operations which result in reduced labor costs, but increased depreciation, repairs, and maintenance when compared with plants of some years ago. However, labor is still the single most important cost item.

Table 9.—Annual Building Costs for a Typical Plant Packing Potatoes in 10-Pound Bags, 80- 120- and 240-Day Runs, 1981-82 Crop Year

Item	Total cost	Cost per 10-lb. bag		
		80-day run	120-day run	240-day run
Number of bags packed		613,440	920,160	1,840,320
	dollars		cents	
Depreciation	6,918.00	1.13	0.75	0.38
Interest on investment	9,944.63	1.62	1.08	0.54
Insurance	691.80	0.11	0.08	0.04
Repairs	1,729.50	0.28	0.19	0.09
Total	19,283.93	3.14	2.10	1.05

Production costs can be affected greatly by volume of output or the total volume of potatoes packed. Cost efficiencies, when measured by costs per unit—hundredweight or 10-pound bag—can occur as volume is increased. Fixed costs are spread over a greater volume of output. Fixed costs are those that would be incurred, regardless of whether the plant is operating or not. Depreciation on equipment and buildings and administrative overhead are examples of fixed costs. In this model the costs for three assumed levels of output have been worked out.

It is assumed that the grading line is 36 inches wide. That is, the equipment such as sizers, washers, and graders, have 36-inch wide conveyors over which the potatoes are spread. According to manufacturers' specification, a 36-inch grading line operating at peak capacity should be able to receive 14,000 pounds of potatoes per hour. An operator packing normal yields would expect about 1,400 pounds, or 10 percent of the incoming potatoes to be undersize and an additional 1,900 pounds would be culls and jumbos. That leaves 10,700 pounds available for packing in 10-pound bags. Therefore, the number of 10-pound bags packed per hour is 1,070.[1]

The total time that the line will be operating during an 8-hour day will be seven hours and ten minutes—after allowing 30 minutes for downtime and breaks, and 20 minutes for starting up, closing down and minor maintenance. Therefore, the number of 10-pound bags packed during an 8-hour day was estimated in the following manner.

	Bags
10-pound bags packed per hour	1,070
Per 8-hour day without lost time	8,560
Lost time due to:	
Start up, close down, 20 minutes = 1,070 bags x 20 ÷ 60	357
Breaks, 30 minutes = 1,070 bags x 30 ÷ 60	535
Total 10-pound bags packed per day	7,668

[1] Haines Equipment Inc., Avoca, New York.

Table 10.—Equipment Costs Associated with Packing Potatoes, 10-Pound Bags, 1981-82 Crop Year

Equipment	New cost	Cost per hour		
		80-day run	120-day run	240-day run
	dollars		dollars	
Hopper	3,500	0.96	0.70	0.44
Sizer	7,000	1.90	1.39	0.87
Grading table	7,050	1.91	1.39	0.87
Washer	7,787	2.12	1.54	0.96
Jumbo sizer	5,500	1.51	1.09	0.69
Tying mechanism	9,000	2.45	1.78	1.12
10-head bagger	25,000	6.79	4.94	3.09
Skid loader	15,000	4.08	2.97	1.86
Forklift	22,000	9.30	6.56	3.83
Skids (300)	4,500	1.70	1.14	0.56
Total	106,337	32.72	23.50	14.29
Per 10-pound bag:			cents	
Fixed		2.28	1.32	.36
Variable		1.13	1.13	1.13
Total		3.41	2.45	1.49

Assuming that 7,668 bags are packed per day:

	Bags packed
80-day run	613,440
120-day run	920,160
240-day run	1,840,320

BUILDINGS

A packing plant similar to the one described in this model would require a space of approximately 12,000 square feet. The total building costs were estimated to be $138,360. The costs associated with buildings are calculated in a manner similar to that of grower/shipper model and are presented in Table 9. The following percentages were used to calculate building costs.

	Percent
Depreciation	5.0
Interest (½ building value, $69,180)	14.375
Insurance	0.5
Repairs	1.25

Total building costs have been estimated at 1.1¢ to 3.1¢ per bag, depending on the volume of potatoes packed (Table 9).

EQUIPMENT

Although the capacity and the degree of automation may be somewhat greater, the type of equipment used in a modern packing plant is similar to that which would be used by growers on their own farms. Usually potatoes destined for tablestock are washed to remove any soil particles still adhering to the tubers. Washing is accomplished by means of a spray-type washer, and drying is done by means of water-absorbing sponge rollers which are attached to the grader. The job of bag-filling, weighing, and bag closing is automatic.

Table 10 presents the equipment costs that might occur at a typical packing plant. Depreciation is calculated on a straight line basis and a useful life of 20 years was assumed. Interest on investment is calculated at 14.375 percent of half the investment (one-half the purchase price). Insurance and storage are calculated at the rate of 1.5 percent of the purchase price and hourly repairs at the rate of 9 to 30¢ per $1,000 of the original purchase price, depending on the machine. Costs are worked out on a per-hour and per-bag basis at the three levels of production.

The equipment complement used in this model is similar to the one used for the model in which 75-pound bags were packed (Table 6). It was found that the proportions of fixed and variable costs were 67 percent and 33 percent respectively. These same factors have been applied to equipment for packing in 10-pound bags (Table 10). The total equipment cost per 10-pound bag ranged down from 3.41 cents to 1.49 cents for 80-day to 240-day runs respectively (Table 10).

LABOR

The hourly wage rate paid to each of the 14 workers would depend on their skill and the type of job done. In this particular case labor costs were estimated to be $79.00 per hour. Added to that are the employer-paid benefits which would bring the total cost to $85.40. In the model it was also assumed that there would be two additional office workers. These costs, including benefits would come to $14.05 per hour. When both the direct labor and office staff are considered, labor costs worked out ot 10.38¢ per bag (Table 11).

TOTAL COSTS

FIXED

The total cost of packing potatoes in 10-pound bags has been broken into fixed and variable costs (Table 12). Fixed costs are those that are incurred whether production occurs or not. In this model the same fixed costs are applied to the 80- 120- and the 240-day run; therefore, the costs per 10-pound bag necessarily decrease as the same fixed costs are spread over more units of output. The buildings, equipment, and installation are all fixed costs and amount to 5.46 cents per 10-pound bag for the 80-day run (Table 12).

The installation costs were based on an estimated 20-year life and installation costs of $5,000 and divided by the number of bags packed.

Table 11.—Labor Costs for Packing Potatoes in 10-Pound Bags, 1981-82 Crop Year

Item	Per hour
	dollars
Direct labor:	
1 skid loader operator	6.50
4 graders @ $4.85 per hour	19.40
2 weight checkers @ $4.85 per hour	9.70
1 stitcher	4.85
2 balers @ $5.35 per hour	10.70
1 pallet mover	6.50
1 cleaner	5.35
1 mechanic	8.00
1 supervisor	8.00
Total	79.00
Employer paid benefits:	
Unemployment insurance	1.98
Canada Pension Plan	1.42
Workmen's compensation	3.00
Total	6.40
TOTAL DIRECT LABOR	85.40
Office staff:	
1 person @ $5.00 per hour	5.00
1 salesperson @ $8.00 per hour	8.00
Total	13.00
Employer paid benefits:	
Unemployment insurance	0.33
Canada Pension Plan	0.23
Workmen's compensation	0.49
Total	1.05
TOTAL OFFICE STAFF	14.05
TOTAL DIRECT & OFFICE LABOR	99.45
	cents
Labor costs per 10-lb. bag:	
Direct	8.91
Office	1.47
Total	10.38

VARIABLE

Variable costs change with the level of output—however, on a per-unit basis they remain the same.

Electricity costs were 2 percent of equipment costs divided by the number of bags packed, or .02 x $106,337 ÷ bags packed.

Interest on operating capital is calculated at 1.5 percent per month on the cost of the bags. It was assumed that a packer would be selling more or less regularly, so operating costs could be paid regularly, hence

Table 12.—Total Cost of Packing Potatoes in 10-Pound Bags, by Volume of Output, 1981-82 Crop Year

Item	Cost per 10-pound bag		
	80-day run	120-day run	240-day run
		cents	
Fixed:			
Buildings	3.14	2.10	1.05
Equipment	2.28	1.32	.36
Installation	.04	.03	.01
Total	5.46	3.45	1.42
Variable:			
Equipment	1.13	1.13	1.13
Electricity	.35	.35	.35
Labor	8.91	8.91	8.91
Office salaries	1.47	1.47	1.47
Bags	8.00	8.00	8.00
Interest on operating capital	.32	.48	.96
Marketing Board fees	.10	.10	.10
Office supplies	.80	.80	.80
Total	21.08	21.24	21.72
TOTAL	26.54	24.69	23.14

no interest charge would be incurred. Bags, however, must be bought in advance. Therefore an interest charge is included. It was calculated as follows:

	Cost, ¢ per bag
80-day run, 8¢ x 1.5% x 80 ÷ 30	.32
120-day run, 8¢ x 1.5% x 120 ÷ 30	.48
240-day run, 8¢ x 1.5% x 240 ÷ 30	.96

Other costs—Marketing Board fees were allowed at 1¢ per hundredweight packed, or .1¢ per bag. Office supplies were estimated at 3 percent of the total costs.

APPENDIX

Many factors can affect the cost of packing potatoes. For example, the age, size and location of the buildings; the plant layout; the age, cost, and general condition of the equipment; the ability and skill of the labor force; the prevailing wage rate; and the market irregularities that prevent steady product flows are all important considerations. Quite often the above listed factors are beyond the control of the owner-manager.

With this in mind, the following comments serve to point out instances where costs could vary considerably from those presented in the model.

1. In the case of the model that estimates costs of packing potatoes in 75-pound bags, all costs are based on an output of 800 bags packed per day (717 allowing for down time and work stoppages). Under good conditions the output may be as high as 150 to 180 bags per hour. At 150 bags per hour packing costs would be considerably lower. The model suggests that labor costs per bag would be reduced from 61.04 cents to 41.07 cents, and machinery costs from 27.83 cents to 21.31 cents. Total packing costs would be 26.49 cents per bag lower, or 35.32 cents per hundredweight lower.

2. It is recognized that commercial packers would encounter labor inefficiencies due mainly to insufficient orders and the necessity of maintaining a steady labor force over a given period of time. This is especially true for firms operating under a 120- to 240-day run. Packers have suggested that under a 240-day run, labor costs could be as much as 25 percent higher. A 25 percent increase in the cost of labor would have the effect of increasing the cost of packing in 10-pound bags by 1.94 cents per bag, or 19.4 cents per hundredweight.

3. It is also recognized that packers operating commercially will, in many instances, incur additional labor costs. Commercial packers have suggested that a benefit package including such items as a dental plan, group insurance, and paid vacations could conceivably increase the total basic hourly rate by as much as 25 to 30 percent.

4. Waste disposal, water supply, and certain other costs associated with washing do not necessarily apply to all operations, but could be a significant cost under certain conditions.

5. Packers delivering to chain stores and other major retail outlets sometimes require special skids, called GMP skids. They cost $22 each, somewhat higher than the $15 ones used in the model. Also, it is felt that a 10 cent procurement cost for 10-pound bags is more appropriate than the 8 cents used in the model.

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